

APPENDIX F

AXIAL LOAD WITH BIAXIAL BENDING - EXAMPLE

F-1. In accordance with paragraph 4-5, design an 18- by 18-inch reinforced concrete column for the following conditions:

$$f'_c = 3,000 \text{ psi}$$

$$f_y = 60,000 \text{ psi}$$

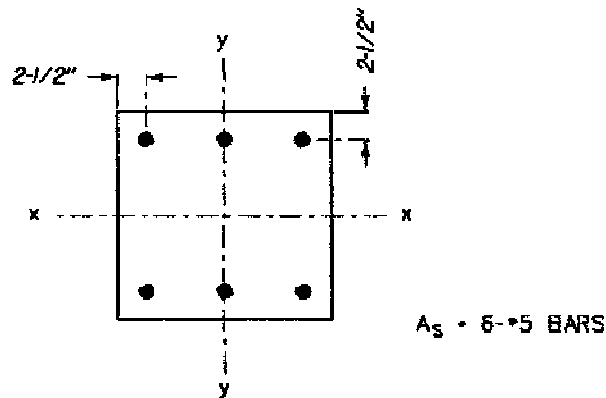
$$P_u = 100 \text{ kips}, P_n = P_u/0.7 = 142.9 \text{ kips}$$

$$M_{ux} = 94 \text{ ft-kips}, M_{nx} = M_{ux}/0.7 = 134.3 \text{ ft-kips}$$

$$M_{uy} = 30 \text{ ft-kips}, M_{ny} = M_{uy}/0.7 = 42.8 \text{ ft-kips}$$

Let concrete cover plus one-half a bar diameter equal 2.5 in.

F-2. Using uniaxial design procedures (Appendix E), select reinforcement for P_n and bending about the x-axis since $M_{nx} > M_{ny}$. The resulting cross-section is given below.



F-3. Figures F-1 and F-2 present the nominal strength interaction diagrams about x and y axes. It is seen from Figure F-2 that the member is adequate for uniaxial bending about the y-axis with $P_n = 142.9$ kips and $M_{ny} = 42.8$ ft-kips. From Figures F-1 and F-2 at $P_n = 142.9$ kips:

$$M_{ox} = 146.1 \text{ ft-kips}$$

$$M_{oy} = 145.9 \text{ ft-kips}$$

For a square column, must satisfy:

$$(M_{nx}/M_{ox})^{1.75} + (M_{ny}/M_{oy})^{1.75} \leq 1.0$$

$$(134.3/146.1)^{1.75} + (42.8/145.9)^{1.75} = 0.98 < 1.0$$

If a value greater than 1.0 is obtained, increase reinforcement and/or increase member dimensions.

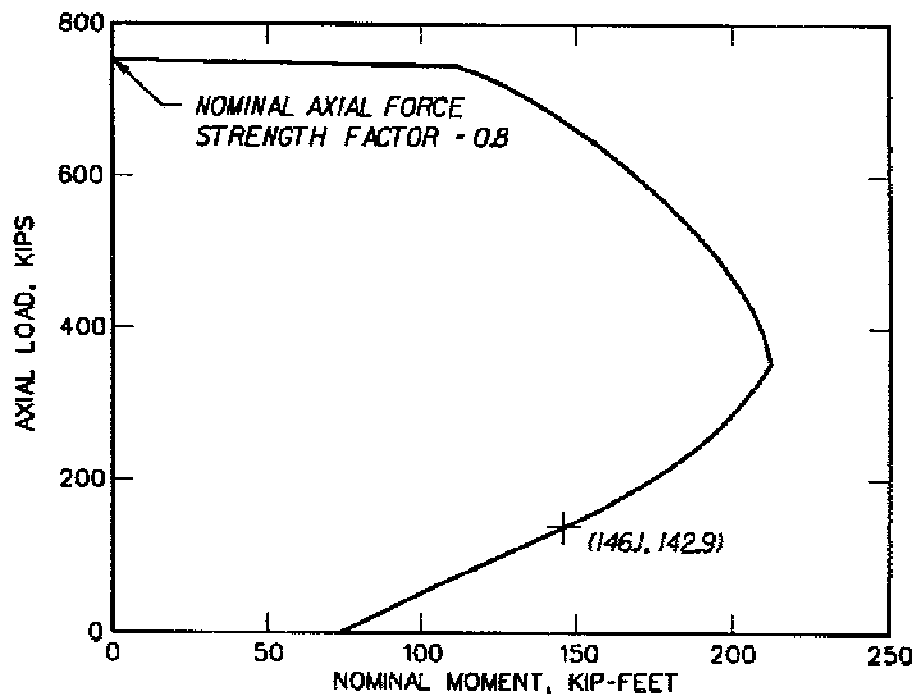


Figure F-1. Nominal strength about the X-axis

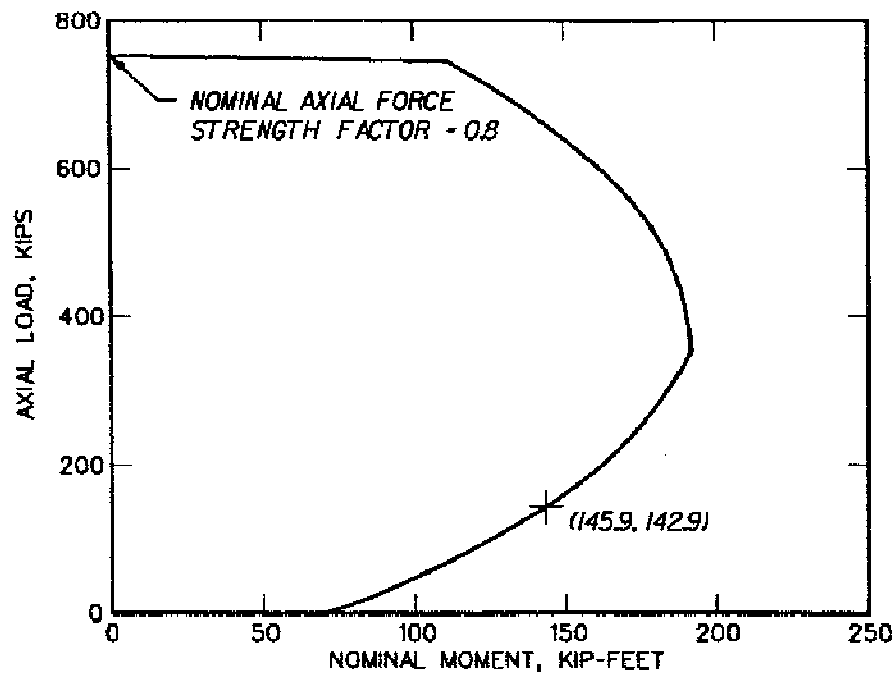


Figure F-2. Nominal strength about the Y-axis